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EXAMINER	
DASTOURI, MEHRDAD	
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2623	9

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/474,715	AUFRICHTIG ET AL.	
	Examiner	Art Unit	
	Mehrdad Dastouri	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-11 and 13-75* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-11,13-48,50-63 and 65-75* is/are rejected.

7)☒ Claim(s) *49 and 64* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 12, 2004 has been entered.

Response to Amendment

2. Applicants' amendment filed January 12, 2004, has been entered and made of record.

3. Applicants' arguments filed January 12, 2004 have been fully considered but they are not persuasive.

Concerning Claims 1, 2, 9, 10, 11, 14, 17, 18, 29, 30, 31 and 36, Applicants argue in essence that prior art of record (Granfors et al., Granfors hereinafter) does not teach a gradient on which the correction value for defective pixel is based on surrounding neighboring pixels of the defective pixel as remaining matrix elements, and Granfors teaches at most two neighboring pixels and not each surrounding pixels of the defective pixel as additional matrix elements.

The Examiner disagrees and indicates Claim 1 broadly recites "an array of pixels" and "an array of local gradient matrix". Claim language does not recite a two-dimensional array of pixels or a two-dimensional local gradient matrix. Consequently a

one-dimensional matrix of 1 x m element (e.g., 1 x 3 element) as taught by Granfors meet claimed language limitations. Two surrounding neighboring pixels are adequate for determining the gradient matrix.

Regarding Claim 5, Granfors discloses the correction value includes a linear interpolation (averaging) of pixel values corresponding to the highest local gradient matrix elements (Column 3, Lines 56-67, Column 4, Lines 1-65. Bad pixels are those pixels that result in generating highest gradients between their intensity values and the intensities of their neighboring pixels. Consequently, the pixels in vicinity of the defective pixels will generate highest local gradient matrix elements.).

Regarding Claim 8, Granfors discloses identifying the defective pixel in the image produced by the detector before the determining step (a) (Column 3, Lines 29-55); and

replacing temporarily the defective pixel with a linear interpolation of a surrounding neighborhood pixels before the determining step (a) (Column 3, Lines 29-67, Column 4, Lines 1-11);

Regarding Claims 19-21, 23 and 26-28, 35 U.S.C. 112, sixth paragraph does not apply because the claim limitations does not recite specific components for performing functions associated with steps in Figure 3 (i.e., matrices A and H). The elements in Granfors invention perform the identical function specified in the claim in substantially the same way, and produce substantially the same results as the corresponding element disclosed in the specification. Kemco Sales, Inc. v. Control Papers Co., 208 F.3d 1352, 54 USPQ2d 1308 (Fed. Cir. 2000).

It is respectfully submitted that "gradient" is a change in the value of a quantity with respect to the change in a given variable. For digital images the quantity is the intensity of the pixels and the given variable is the location of the pixels. Claim 1 does not recite a specific gradient filter.

Arguments analogous to those mentioned above are applicable to Claims 4, 13, 22 and 32.

Regarding Applicants' arguments concerning Claim 37 (Point 4), while using larger alternative 5x5 or 7x7 filters are explicitly suggested by Granfors (Column 4, Lines 1-11), utilizing an exemplary smaller size kernel of 3x3 by Granfors, does not mean that the prior art excludes the use of these larger alternative 5x5 or 7x7 filters. There is no suggestion in Granfors invention that prohibits the use of suggested 5x5 or larger filters. The same arguments apply to the Schreiner's invention, (U.S. 5,617,461), concerning utilization of 31x31 kernels for correction of defective pixels.

Applicants' arguments regarding Claims 6, 7, 15, 16, 24, 25, 34 and 35 are moot in view of new grounds of rejection.

Claim Objections

4. Claims are objected to because of the following informalities:

In Claims 49 and 64, matrices "A_i" and "H" should be identified.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 2, 5, 8-11, 14, 17-21, 23, 26-31, 33, 36, 44-47, 50-52, 56, 57, 59-62, 65-67, 71, 74 and 75 are rejected under 35 U.S.C. 102(b) as being anticipated by Granfors (U.S. 5,657,400), hereinafter Granfors.

Regarding Claim 1, Granfors discloses a method for correcting a defective pixel in an image produced by a detector, the image including an array of pixels and the array of pixels having a corresponding array of pixel values, comprising:

(a) determining a local gradient, the local gradient comprising an array of local gradient matrix elements (Column 3, Lines 65-67, Column 4, Lines 1-11; Figure 3; Column 4, Lines 38-53. A digital image is a two-dimensional array of pixels comprising of a plurality of one-dimensional array of pixels having the pixel intensities as a corresponding pixel values. The local gradient matrix is generated from the convolution of a plurality of filter kernels (one-dimensional or two-dimensional)and the array of the image pixel values.); and

(b) providing a correction value based on the local gradient to correct the defective pixel (Figure 3; Column 4, Lines 12-53);

wherein at least a portion of the array of pixel values comprises a matrix, and includes the defective pixel as a center matrix element and each surrounding neighboring pixel of the defective pixel as additional matrix elements (Figure 3; Column 4, Lines 38-53. The center pixel 34 and its surrounding neighboring pixels "W" and "E"

is a one-dimensional matrix of 1 x m element (e.g., 1 x 3 element) utilized in correcting the defective pixel value.).

Regarding Claim 2, Granfors further discloses the method of Claim 1, wherein step (a) of determining a local gradient includes determining the local gradient in part from a gradient kernel and at least a portion of the array of pixel values (Column 3, Lines 65-67, Column 4, Lines 1-11; Figure 3; Column 4, Lines 38-53).

Regarding Claim 5, arguments analogous to those presented for Claim 1 is applicable to Claim 5. Granfors further discloses providing a correction value includes at least one of a linear interpolation and a weighted average of pixel values corresponding to the highest local gradient matrix elements (Column 3, Lines 56-67, Column 4, Lines 1-65. Bad pixels are those pixels that generate highest gradient.).

Regarding Claim 8, Granfors further discloses the method of Claim 1, further comprising:

identifying the defective pixel in the image produced by the detector before the determining step (a) (Column 3, Lines 29-55);

replacing temporarily the defective pixel with a linear interpolation of a surrounding neighborhood pixels before the determining step (a) (Column 3, Lines 29-67, Column 4, Lines 1-11); and

replacing the defective pixel with the correction value after the providing step (b) (Column 4, Lines 66-67, Column 5, Lines1-7).

Regarding Claim 9, Granfors further discloses the method of Claim 1, further comprising repeating steps (a)-(b) a plurality of times as desired to correct a plurality of defective pixels in the image produced by the detector (Column 4, Lines 12-23).

With regards to Claims 10, 19 and 29, arguments analogous to those presented for Claim 1 are applicable to Claims 10, 19 and 29.

With regards to Claims 11, 20 and 30, arguments analogous to those presented for Claim 2 are applicable to Claims 11, 20 and 30.

With regards to Claims 21 and 31, arguments analogous to those presented for Claim 3 are applicable to Claims 21 and 31.

With regards to Claims 14, 23 and 33, arguments analogous to those presented for Claim 5 are applicable to Claims 14, 23 and 33.

Regarding Claim 17, Granfors further discloses the method of Claim 10, wherein the detector comprises an array of photodetector elements, each photodetector element configured to convert an impinging photonic energy into an electrical signal proportional thereto (Figure 2B; Column 2, Lines 49-67).

With regards to Claim 18, arguments analogous to those presented for Claim 2 are applicable to Claim 18.

Regarding Claim 26, Granfors further discloses the system of Claim 19, wherein the means for determining and the means for providing include determining the local gradient and generating the correction value, respectively, for each of a plurality of defective pixels in the image produced by the detector (Column 4, Lines 12-65).

With regards to Claim 27, arguments analogous to those presented for Claim 8 are applicable to Claim 27.

Regarding Claim 28, Granfors further discloses the system of Claim 27, wherein the means for replacing includes at least one of replacing the defective pixel with the correction value, and storing the correction value with an identifying link to the defective pixel in a storage device (Column 4, Lines 54-65).

With regards to Claim 36, arguments analogous to those presented for Claim 8 are applicable to Claim 36.

Regarding Claim 44, Granfors discloses a method for correcting a defective pixel in an image produced by a digital detector having a defective input at the defective pixel, the image including an array of pixels and the pixels having corresponding pixel values, the method comprising:

analyzing a characteristic of each of a plurality of pixels (Column 1, Lines 48-52. The intensity of each pixel is the characteristic being analyzed. In addition, the gradient of the pixels, i.e., the difference in the pixel values of good pixels and bad pixels in median filtering recited in Column 4, Lines 1-11, or the average values of good pixel values recited in Column 4, Lines 38-53, are further characteristics utilized in analysis.);

selecting a first pixel of the plurality of pixels having a first pixel value based on the analyzed characteristic of the first pixel (Figure 3, pixel E or any of the pixels surrounding pixel 34);

selecting a second pixel of the plurality of pixels having a second pixel value based on the analyzed characteristic of the second pixel (Figure 3, pixel W or any of the pixels surrounding pixel 34 except for pixel E);

selecting a third pixel of the plurality of pixels having a third pixel value based on the analyzed characteristic of the third pixel (Figure 3, pixel N or any of the pixels surrounding pixel 34 except for pixels E and W); and

providing a pixel value for the defective pixel using the first, second, and third pixel values (Column 4, Lines 38-65. The values of first to eighth neighboring pixels are utilized for providing a pixel value for the defective pixel. The broad claim language does not recite a particular combination of the three pixel values simultaneously.).

Regarding Claim 45, Granfors discloses the method of Claim 44, wherein the characteristic analyzed comprises a gradient of each of the plurality of pixels (Column 4, Lines 1-11 and 38-53).

Regarding Claim 46, Granfors discloses method of Claim 45, wherein determining the gradient for each pixel includes temporarily replacing the pixel value of the defective pixel with a calculated pixel value (Column 4, Lines 1-11 and 38-53).

Regarding Claim 47, Granfors further discloses the method of Claim 45, wherein the provided pixel value comprises a linear average of pixel values from pixels that are not defective (Column 4, Lines 38-53).

With regards to Claim 50, arguments analogous to those presented for Claim 5 are applicable to Claim 50.

Regarding Claim 51, Granfors further discloses the method of Claim 44, wherein providing a pixel value for the defective pixel using the first, second, and third pixel values comprises averaging the pixel values used to provide a pixel value for the value of the defective pixel (Column 4, Lines 38-53).

Regarding Claim 52, Granfors further discloses the method of Claim 51, wherein averaging the pixels values comprises using a linear average of the pixel values (Column 4, Lines 38-53).

Regarding Claim 56, Granfors further discloses the method of Claim 44, wherein the first, second, and third pixels are further selected based on whether they bolder the defective pixel in the array of pixels (Column 4, Lines 38-53).

Regarding Claim 57, Granfors further discloses the method of Claim 44, wherein the analyzed characteristic of the plurality of pixels are calculated based on pixel values of the pixels (Column 4, Lines 38-53).

Claims 59-62 and 65-67 recite broader limitations of Claims 44-47 and 50-52, respectively. Therefore, arguments analogous to those presented for Claims 44-47 and 50-52 are applicable to Claims 59-62 and 65-67.

With regards to Claim 71, arguments analogous to those presented for Claim 56 are applicable to Claim 71.

Regarding Claim 74, Granfors further discloses the method of Claim 59, further comprising repeating a process of analyzing a characteristic of each of a plurality of pixels, the characteristic for each of the plurality of pixels based on pixel values; selecting a first pixel of the plurality of pixels having a first pixel value based on the

analyzed characteristic of the first pixel; selecting a second pixel of the plurality of pixels having a second pixel value based on the analyzed characteristic of the second pixel; and providing a pixel value for the defective pixel using the first and second pixel values for each of the defective pixels of the digital detector (Column 4, Lines 1-53).

Regarding Claim 75, Granfors further discloses the method of Claim 59, further comprising determining which pixels of the digital detector are defective before an image to be corrected is received from the digital detector (Column 3, Lines 29-55).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 4, 6, 13, 15, 22, 24, 32, 34, 37-43, 48, 63 and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Granfors (U.S. 5,657,400).

Regarding Claim 4, Granfors further discloses the method of Claim 2, further comprising:

selecting a matrix size of the at least a portion of the array of pixel values (Portion of the digital image corresponding to array of elements 22 shown on Figure 2B); and

selecting the gradient kernel (Column 4, Lines 1-5).

Granfors suggests applying filters with suitably small kernels (e.g., 5x5) to the image (Column 3, Lines 65-67, Column 4, Lines 1-11) but does not explicitly disclose the gradient filter is selected from a group including a Laplacian of a Gaussian filter kernel, a Roberts gradient kernel, a Prewitt gradient kernel, and a Sobel gradient kernel.

Laplacian of a Gaussian filter kernel, Roberts gradient kernel, Prewitt gradient kernel, and Sobel gradient kernel are well known filters conventionally implemented in image processing for filtering images (Official Notice).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to select the gradient kernel from a group including a Laplacian of a Gaussian filter kernel, a Roberts gradient kernel, a Prewitt gradient kernel, and a Sobel gradient kernel because these are the well known filter kernels conventionally utilized in image processing for filtering purposes to identify pixel gradients in the image and detect the edges to enhance digital images.

Regarding Claim 6, Granfors disclose the local gradient matrix comprising twelve elements (Column 4, Lines 38-46) that obviously include at least three highest local gradient matrix elements (Official Notice).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to utilize highest local gradient matrix elements including at least three highest local gradient matrix elements because it will increase the accuracy of the detecting defective pixels.

With regards to Claims 15, 24 and 34, arguments analogous to those presented for Claim 6 are applicable to Claims 15, 24 and 34.

With regards to Claims 13, 22, 32, 48 and 63 arguments analogous to those presented for Claim 4 are applicable to Claims 13, 22, 32, 48 and 63.

With regards to Claim 37, arguments analogous to those presented for Claim 1 are applicable to Claim 37. Global characteristic is the gradients of the pixels, or the intensities of pixels.

With regards to Claims 39 and 40, arguments analogous to those presented for Claim 1 are applicable to Claims 39 and 40.

With regards to Claims 38 and 41-43, 5 x 5 and 7 x 7 filter kernels suggested by Granfors are well-known filters conventionally implemented in image processing for filtering images (Official Notice).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to select the 5 x 5 and 7 x 7 gradient kernels because these are the well known filter kernels conventionally utilized in image processing for filtering purposes to detect and enhance the features in digital images.

Regarding Claim 73, Granfors further disclose providing the image data to a user, wherein the image data comprises the first pixel value, the second pixel value, and the pixel value provided for the defective pixel (Column 4, Lines 38-53), but does not disclose displaying these data.

Displaying data is extremely well known in the art (Official Notice).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to display image data comprising the first pixel value, the second pixel value, and the pixel value provided for the defective pixel because it is a

conventional method for presenting the data routinely implemented in the art of image processing.

9. Claims 7, 16, 25, 35, 53-55, 58, 68-70 and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Granfors (U.S. 5,657,400) in view of Watanabe et al (U.S. 5,854,655), hereinafter Watanabe.

Regarding Claim 53, Granfors does not disclose the method of Claim 51, wherein averaging the pixels values comprises using a weighted average of the pixel values.

Watanabe discloses a defective pixel detecting system using a weighted average of the pixel values for providing a pixel value for the defective pixel (Figure 7; Column 14, Lines 17-67, Formula (5)).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Granfors invention according to the teachings of Watanabe to use a weighted average of the pixel values for providing a pixel value for the defective pixel because it will increase the reliability of the correction system and will provide more accurate results.

Regarding Claim 54, Watanabe further discloses the method of Claim 53, wherein a weight assigned to each pixel value used to provide the pixel value of the defective pixel is based on a characteristic used to select the pixel to be used to provide a value for the defective pixel (Figure 7; Column 14, Lines 17-67, Formula (5)).

Regarding Claim 55, Watanabe further discloses the method of Claim 53, wherein a weight assigned to each pixel value used to provide the pixel value of the

defective pixel is based on a proximity of the pixel to be used to provide a value for the defective pixel to the defective pixel (Figure 7; Column 14, Lines 17-67, Formula (5)).

Regarding Claim 58, Watanabe further discloses the method of Claim 44, wherein the characteristic analyzed comprises a characteristic selected from a group consisting of edge strength, gradient strength, and image feature strength (Column 6, Lines 49-67, Column 7, Lines 1-25. Image feature strength based on the pixel intensities is the analyzed characteristic.).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Granfors invention according to the teachings of Watanabe to use image feature strength as an analyzed characteristic because it will increase the reliability of the correction system and will provide more accurate results.

Regarding Claim 58, it is further submitted that the results of the applied filtering by prior arts of record are the edge and gradient strength which are further utilized in defective pixel correction procedure.

With regards to Claim 7, arguments analogous to those presented for Claims 6 and 58 are applicable to Claim 7.

With regards to Claims 16, 25 and 35, arguments analogous to those presented for Claim 7 are applicable to Claims 16, 25 and 35.

With regards to Claims 68-70, arguments analogous to those presented for Claims 53-55 are applicable to Claims 68-70, respectively.

With regards to Claim 72, arguments analogous to those presented for Claim 58 are applicable to Claim 72.

Allowable Subject Matter

10. Claims 49 and 64 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, and overcome the informalities set forth in the Office Action.

Claim 49 of the instant application recites the method of Claim 45, wherein the gradient for each pixel is determined by $G_i = SQRT ((A_i * H)^2 + (A_i * (-H))^2)$.

Claim 64 of the instant application recites the method of Claim 60, wherein the gradient for the first and second pixels are determined by applying $G_i = SQRT ((A_i * H)^2 + (A_i * (-H))^2)$.

Contact Information

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mehrdad Dastouri whose telephone number is (703) 305-2438. The examiner can normally be reached on Monday to Friday from 8:00 a.m. to 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEHRDAD DASTOURI
PRIMARY EXAMINER

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Primary Examiner
Group Art Unit 2623
March 7, 2004